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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,731	07/16/2004	Yoshihide Fuse	Q81873	4371
23373 7590 12/21/2006 SUGHRUE MION, PLLC 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON, DC 20037			EXAMINER PUTTLITZ, KARL J	
			ART UNIT	PAPER NUMBER
			1621	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		12/21/2006	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/501,731

Applicant(s)

FUSE ET AL.

Examiner

Karl J. Puttlitz

Art Unit

1621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-51 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-51 is/are rejected. .
- 7) ☒ Claim(s) 27 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>various</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Specification***

The first sentence of the specification requires a cross-reference to the counterpart PCT application; see 37 CFR 1.78 and MPEP § 201.11.

### ***Claim Objections***

Claim 27 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 20 recites that the reaction solvent is water, which is already required by claim 20, from which claim 27 depends.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 15 and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 15 and 16 recite "compatibility with water" in connection with an organic solvent. It is unclear how this term modifies the organic solvent.

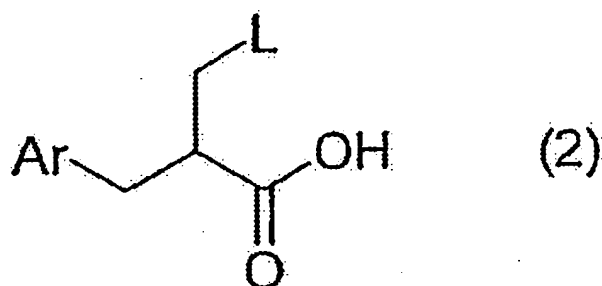
***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

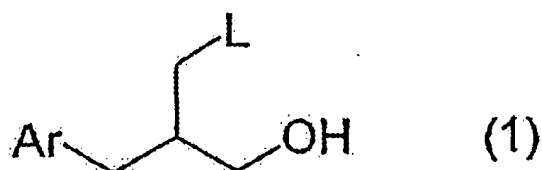
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,121,477 to Yasohara et al. (Yasohara) in view of Organic Chemistry, 2<sup>nd</sup> ed., Ege, ed., 1989 (Organic Chemistry).

The rejected claims cover a method for producing a 2-aralkylpropionic acid represented by Formula (2):



wherein Ar is an optionally substituted aryl group having 6 to 18 carbon atoms, and L is a sulfonyloxy group or a halogen atom, comprising oxidizing a 2-aralkyl-1-propanol represented by Formula (1):



wherein Ar and L are as defined above, using a permanganate under an acidic condition.

The rejected claims also cover those embodiments wherein Ar is an optionally substituted phenyl group or an optionally substituted naphthyl group.

The rejected claims also cover those embodiments wherein L is an optionally substituted straight, branched or cyclic alkylsulfonyloxy group having 1 to 6 carbon atoms or an optionally substituted arylsulfonyloxy group having 6 to 18 carbon atoms, specifically a methanesulfonyloxy group or a toluenesulfonyloxy group.

The rejected claims also cover those embodiments wherein the permanganate is an alkaline metal salt of permanganic acid, specifically the alkaline metal salt of permanganic acid is potassium permanganate.

The rejected claims also cover those embodiments wherein the acidic condition is formed in acidic aqueous solution consisting of water and acetic acid or water and sulfuric acid.

The rejected claims also cover those embodiments wherein a solvent mixture of the acidic aqueous solution and an organic solvent is employed, and specifically the organic solvent is an organic solvent having no compatibility with water and the reaction is conducted in a biphasic system with the acidic aqueous solution.

The rejected claims also cover those embodiments wherein the organic solvent having no compatibility with water is an acetic alkyl ester having 1 to 6 carbon atoms, specifically the acetic alkyl ester having 1 to 6 carbon atoms.

Art Unit: 1621

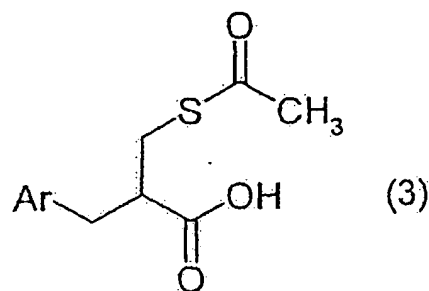
The rejected claims also cover those embodiments wherein the organic solvent is an organic solvent having a compatibility with , and specifically the organic solvent having a compatibility with water is acetone, tetrahydrofuran or tert-butanol.

The rejected claims also cover those embodiments wherein the acidic aqueous solution consists of sulfuric acid and water and the reaction is conducted in a solvent mixture system with acetone.

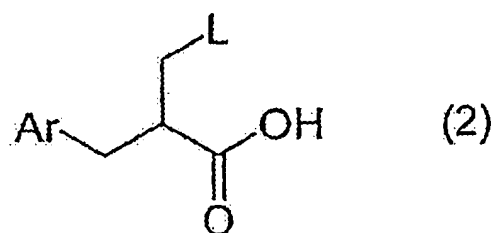
The rejected claims also cover those embodiments wherein a treatment with a reducing agent is conducted under an acidic condition after the reaction.

The rejected claims also cover those embodiments wherein the reducing agent is a hydrogen sulfite, sulfite, pyrosulfite or an aqueous solution thereof.

The rejected claims also cover a method for producing a 2-aralkyl-3-acetylthiopropionic acid represented by Formula (3):



wherein Ar is an optionally substituted aryl group having 6 to 18 carbon atoms comprising reacting a 2-aralkylpropionic acid represented by Formula (2):



wherein Ar is as defined above and L is a sulfonyloxy group or a halogen atom with a thioacetate in the presence of water.

The rejected claims also cover those embodiments wherein Ar is an optionally substituted phenyl group or an optionally substituted naphthyl group.

The rejected claims also cover those embodiments wherein L is an optionally substituted straight, branched or cyclic alkylsulfonyloxy group having 1 to 6 carbon atoms or an optionally substituted arylsulfonyloxy group having 6 to 18 carbon atoms.

The rejected claims also cover those embodiments wherein the reaction solvent is water or wherein the reaction solvent is a solvent mixture of water and an organic solvent. The organic solvent is an organic solvent having no compatibility with water and the reaction is conducted in a biphasic system with water. The organic solvent having no compatibility with water is an aromatic hydrocarbon or an acetic alkyl ester having 1 to 6 carbon atoms. 31. The method according to claim 30 wherein the organic solvent having no compatibility with water is toluene or ethyl acetate.

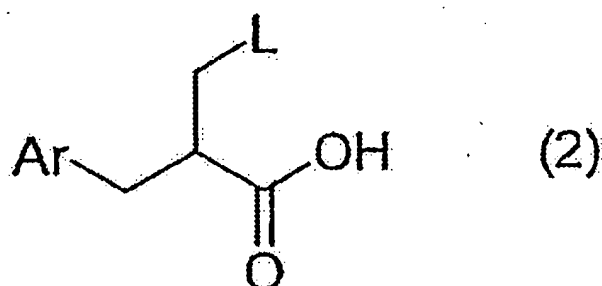
The rejected claims also cover those embodiments wherein the organic solvent is an organic solvent having a compatibility with water. The organic solvent having a compatibility with water is alcohol having 1 to 3 carbon atoms, such as methanol. The thioacetate is an alkaline metal salt of thioacetic acid, such as potassium thioacetate.

The rejected claims also cover those embodiments wherein the reaction is conducted under an inert gas atmosphere.

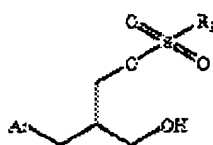
Art Unit: 1621

The rejected claims also cover those embodiments wherein the 2-aralkylpropionic acid represented is obtained using a permanganate under an acidic condition, as claimed above.

With regard to the embodiments preparing the 2-aralkylpropionic acid represented by Formula (2),



Yasohara teaches 2-aralkyl-3-sulfonyloxy-1-propanol having the following general formula (1):



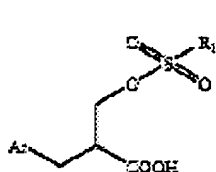
wherein Ar is an aryl group that may be substituted and R<sub>1</sub> is methyl group, ethyl group, n-propyl group, isopropyl group, benzyl group, p-chlorophenyl group, p-bromophenyl group, p-methoxyphenyl group, o-nitrophenyl group, m-nitrophenyl group, p-nitrophenyl group or 1-naphthyl group, see column 2.

Yasohara also teaches that by oxidizing the hydroxyl group of the optical active 2-aralkyl-3-sulfonyloxy-1-propanol having the general formula (1) an optical active 2-



Art Unit: 1621

aralkyl-3-sulfonyloxypropionic acid having the following general formula (3) can be obtained:



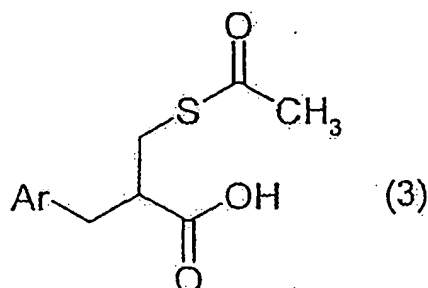
wherein Ar is an aryl group that may be substituted and R<sub>1</sub> is an alkyl group that may be substituted or an aryl group that may be substituted, see description bridging columns 7 and 8. Specifically, using a catalyst, in a binary phase system comprised of an organic phase including potassium bromide and a phase transfer catalyst and a water phase, the compound having the general formula (3) can be easily obtained by reacting a compound having the general formula (1) with sodium hypochlorite, followed by extracting, in an acidic condition, with an organic solvent such as toluene and ethyl acetate and removing the solvent, see column 8, lines 14-30.

The difference between the process disclosed in Yasohara and the process covered by the rejected claims is that while Yasohara teaches that hypochlorite is used as an oxidizing agent, the claims require permanganate. However, it is for this proposition that the examiner joins Organic Chemistry. Specifically, Organic Chemistry shows that potassium permanganate with sulfuric acid is a well known oxidizing system for preparing carboxylic acids from alcohols. In this regard, those of ordinary skill would have been motivated to modify the disclosure of Yasohara to include a permanganate system required by the claims, since Organic Chemistry demonstrates that this is a routine and effective way to convert alcohols to carboxylic acids.

Art Unit: 1621

Accordingly, the rejected claims are prima facie obvious in view of Yasohara and Organic Chemistry since these references teach the elements of the rejected claims with a reasonable expectation of success.

With regard to the embodiments for producing a 2-aralkyl-3-acetylthiopropionic acid represented by Formula (3):



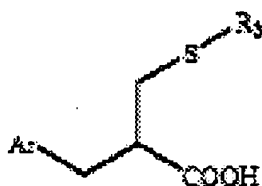
Yasohara teaches reacting an optical active 2-aralkyl-3-sulfonyloxypropionic acid with a thio-compound having the following general formula (7):



(7)

wherein  $R_3$  is an alkyl group that may be substituted, an acyl group that may be substituted or an aryl group that may be substituted and Y is a hydrogen atom or an alkali metal atom,

to prepare an optical active 2-aralkyl-3-thiopropionic acid having the following general formula (8):



wherein Ar is an aryl group that may be substituted and  $R_3$  is an alkyl group that may be substituted, an acyl group that may be substituted or an aryl group that may be substituted.

Yasohara teaches that this reaction can be conducted in a non-organic solvent system, however, it is preferable to conduct it in organic solvent, for example, alcohols such as methanol, ethanol and isopropyl alcohol, halogenated hydrocarbons such as methylene chloride, chloroform and carbon tetrachloride, aromatic hydrocarbons such as benzene, toluene and xylene, ethers such as diethyl ether, tetrahydrofuran and diisopropyl ether, hydrocarbons such as pentane and hexane, acetonitrile, dimethyl sulfoxide, acetone and ethyl acetate. The above solvents can be used alone or in combination of two or more. A base may be added, if necessary. As the base, amines such as triethylamine, trimethylamine, diisopropylethylamine, N,N-dimethylaniline and N,N-diethylaniline, aromatic nitrogen compounds such as pyridine, 4-(N,N-dimethylamino)pyridine, imidazole and 2,6-lutidine, or sodium ethoxide, sodium methoxide, potassium tertiary butoxide, sodium hydride, potassium hydride, calcium carbonate, potassium carbonate, sodium carbonate, lithium carbonate, potassium hydrogen carbonate, sodium hydrogen carbonate can be exemplified. The above bases can be used alone or in combination of two or more. The reaction can be conducted in a

Art Unit: 1621

wide range of temperature, however, usually, a temperature from -10C. to 100C is preferable. If the temperature is out of this range, the efficiency of the reaction is apt to be lowered. After the reaction has been completed, the aimed product can be obtained easily by extracting with an organic solvent such as toluene and ethyl acetate and removing the solvent. If necessary, the product can be highly purified using silica gel column chromatography and so on. See description bridging columns 10 and 11.

The difference between the preparation of a 2-alkyl-3-thiopropionic acid as described in Yasohara, and the same process covered in the claims, is that Yasohara fails to explicitly teach that the reaction can be conducted in the presence of water. However, in the absence of unexpected results, the use of a universal solvent, such as water is well within the motivation of those of ordinary skill, since, for example, water is an inexpensive solvent, or, alternatively, because choice of solvents in a given reaction are routine optimization.

### ***Conclusion***

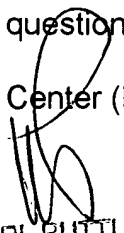
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karl J. Puttlitz whose telephone number is (571) 272-0645. The examiner can normally be reached on Monday to Friday from 9 a.m. to 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thurman K. Page, can be reached at telephone number (571) 272-0602.

Art Unit: 1621

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



KARL PUTTLITZ  
PATENT EXAMINER